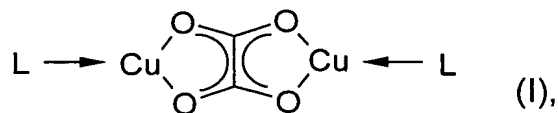


PATENT CLAIMS

1. Compounds of the general formula (I)

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in which copper is in the oxidation state +1, and

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L is R-C≡C-R' having at least one silyl or ester group, R'HC=CHR having at least one silyl or ester group, R'₃Si-C≡C-R', R'₃N, R'₂N(CH₂)_nNR'₂, substituted or unsubstituted 2,2'-bipyridine, 1,10-phenanthroline, P(OR')₃, P(alkyl)₃, R'-O-R', R'-O(CH₂)_nO-R', R'-S-R', R'-S(CH₂)_nS-R' or a nitrile from the group consisting of CH₃-C≡N, ^tBu-C≡N, C₄H₉C≡N and Ph-C≡N,

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where

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R is A, aryl, alkylaryl or alkynyl having at least one SiR'₃ or COOR' group, and

R' is R, H, A, aryl, alkylaryl or alkynyl,

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where L, R and R' may each, independently of one another, adopt identical or different meanings in different positions of the molecule, and

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A is straight-chain or branched C1-C30-alkyl, C3-C30-cycloalkyl, straight-chain or branched C2-C30-alkenyl or straight-chain or branched C3-C30-cycloalkenyl,

aryl is C6-C10-aryl or alkylaryl,

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alkylaryl is C7-C18-alkylaryl,

alkynyl is straight-chain or branched C2-C30-alkynyl.

2. Compounds according to Claim 1, in which

5 A is straight-chain or branched C1-C9-alkyl, straight-chain or branched C3-C9-cycloalkyl, straight-chain or branched C2-C9-alkenyl or straight-chain or branched C3-C9-cycloalkenyl,

10 aryl is phenyl or naphthyl,

alkylaryl is tolyl or mesityl,

alkynyl is straight-chain or branched C2-C9-alkynyl,

15 and R and R' may each, independently of one another, adopt identical or different meanings in different positions of the molecule.

3. Compounds according to Claim 1, in which

20 A is straight-chain or branched C1-C4-alkyl from the group consisting of methyl, ethyl, n- and i-propyl and n-, i- and tert-butyl, C3-C6-cycloalkyl from the group consisting of cyclopropyl, cyclobutyl, cyclopentyl and cyclohexyl, straight-chain or branched C2-C6-alkenyl from the group consisting of vinyl, propenyl, butenyl, pentenyl and hexenyl, or C3-C6-cycloalkenyl from the group consisting of cyclopropenyl, cyclobutenyl, cyclopentenyl, cyclopentadienyl and methylcyclopentadienyl,

30 aryl is phenyl or naphthyl,

alkylaryl is tolyl or mesityl,

35 alkynyl is straight-chain or branched C2-C6-alkynyl from the group consisting of ethynyl, propynyl, butynyl, pentynyl and hexynyl,

and R and R' may each, independently of one another, adopt identical or different meanings in different positions of the molecule.

4. Compounds according to Claim 1,
5 in which L is $R-C\equiv C-R'$ or $R'HC=CHR$, each having at least one silyl or ester group, and the radicals R and R' are as defined in Claim 1.
5. Compounds according to Claim 1,
10 in which L is $R'_3Si-C\equiv C-R'$, where R' is $SiMe_3$, CH_3 , C_2H_5 , C_3H_7 , C_4H_9 , phenyl, COOMe or COOEt.
6. Compounds according to Claim 1,
15 in which L is an alkyne selected from the group consisting of $Me_3Si-C\equiv C-SiMe_3$, $Me_3Si-C\equiv C-nBu$, $MeOOC-C\equiv C-COOMe$, $EtOOC-C\equiv C-COOEt$ and $Me_3Si-C\equiv C-R'$, in which R' is CH_3 , C_2H_5 , C_3H_7 , phenyl, COOMe or COOEt.
7. Compounds according to Claim 1,
20 in which L is an alkene selected from the group consisting of $H_2C=CHSiMe_3$, $H_2C=CHCOOCH_3$, $H_2C=CHCOOC_2H_5$ and $H_2C=CHSiR'_3$, in which R', independently of one another, is CH_3 ,
25 C_2H_5 , C_3H_7 , C_4H_9 , $HC=CH_2$ or phenyl.
8. Compounds according to Claim 1,
in which L is a compound selected from the group consisting of
30 $CH_3-C\equiv N$, $tBu-C\equiv N$, $C_4H_9C\equiv N$, $Ph-C\equiv N$; $N(CH_3)_3$, $N(C_2H_5)_3$, $H_2N-(CH_2)_2-NH_2$, $(CH_3)_2N-(CH_2)_2-N(CH_3)_2$, $(C_2H_5)_2N-(CH_2)_2-N(C_2H_5)_2$, $H_2N-(CH_2)_4-NH_2$, $(CH_3)_2N-(CH_2)_4-N(CH_3)_2$, $(C_2H_5)_2N-(CH_2)_4-N(C_2H_5)_2$, 2,9-dimethyl-1,10-phenanthroline; $P(OCH_3)_3$, $P(OC_2H_5)_3$,
35 $P(OC_6H_{11})_3$, $P(OPh)_3$; $P(CH_3)_3$, $P(C_2H_5)_3$, $P(C_3H_7)_3$, $P(C_4H_9)_3$, $P(C_6H_{11})_3$; $C_2H_5-O-C_2H_5$, $CH_3-O-C_4H_9$, $CH_3O-(CH_2)_2-OCH_3$, C_2H_5O-

$(\text{CH}_2)_2\text{-OC}_2\text{H}_5$, $\text{CH}_3\text{-S-CH}_3$, $\text{C}_2\text{H}_5\text{-S-C}_2\text{H}_5$, $\text{C}_3\text{H}_7\text{-S-C}_3\text{H}_7$, Ph-S-Ph ,
 $\text{CH}_3\text{S-(CH}_2)_2\text{-SCH}_3$, $\text{CH}_3\text{S-(CH}_2)_3\text{-SCH}_3$, $\text{C}_2\text{H}_5\text{S-(CH}_2)_2\text{-SC}_2\text{H}_5$ and
 $\text{PhS-(CH}_2)_2\text{-SPh}$.

- 5 9. Compounds of the general formula (I)
 $\text{di}\{[\text{bis}(\text{trimethylsilyl})\text{acetylene}]\text{copper(I)}\}$ oxalate,
 $\text{di}\{[(\text{trimethylsilyl})(\text{n-butyl})\text{acetylene}]\text{copper(I)}\}$ oxalate,
 $\text{di}\{[(\text{vinyl-t-butyl})\text{dimethylsilane}]\text{copper(I)}\}$ oxalate,
10 $\text{di}\{[(\text{vinyl})\text{diethylmethylsilane}]\text{copper(I)}\}$ oxalate.
10. Process for the preparation of the compounds of the general
 formula (I) according to Claims 1-9, characterised in that Cu_2O is
15 reacted with oxalic acid and a Lewis base L in an inert solvent, and
 the resultant product is isolated.
11. Process according to Claim 10, characterised in that an inert aprotic
 organic solvent is used which is an open-chain or cyclic aliphatic or
20 aromatic hydrocarbon, a halogenated aliphatic or halogenated
 aromatic hydrocarbon or a linear or cyclic ether or a mixture of
 these hydrocarbons.
12. Process according to one of Claims 10 and 11, characterised in that
25 a solvent selected from the group consisting of pentane, hexane,
 heptane, cyclohexane, toluene, methylene chloride, trichloro-
 methane, chlorobenzene, diethyl ether and tetrahydrofuran is used.
13. Process according to Claim 10, characterised in that it is carried out
30 under a protective-gas atmosphere.
14. Process according to Claim 13, characterised in that the protective
35 gas employed is nitrogen or argon.

- 5 15. Process according to Claim 10, characterised in that the Lewis base L is employed in excess relative to the stoichiometric ratio of the starting materials Cu_2O and oxalic acid, but at least in twice the stoichiometric ratio.
- 10 16. Process according to one of Claims 10 and 15, characterised in that the starting materials Cu_2O , oxalic acid and Lewis base L are employed in a stoichiometric ratio of from 1 : 1 : 2 to 1 : 1 : 4.
- 15 17. Process according to one or more of Claims 10, 15 and 16, characterised in that two different Lewis bases L are employed in identical molar amounts.
- 20 18. Process according to one or more of Claims 10 to 17, characterised in that the reaction is carried out within a reaction time of from 1 to 24 hours at a temperature in the range from -30 to $+100^\circ\text{C}$.
- 25 19. Process according to one or more of Claims 10 to 18, characterised in that it is carried out at room temperature.
- 30 20. Process according to one or more of Claims 10 to 19, characterised in that, when the reaction is complete, insoluble constituents are separated off, and the reaction product is isolated from the solution and, if necessary, purified, or in that the reaction product is separated from the reaction mixture by extraction, isolated and, if necessary, purified.
- 35 21. Process according to one or more of Claims 10 to 19, characterised in that insoluble constituents are separated off by filtration.
22. Use of the compounds of the general formula (I) according to Claims 1 to 9 for the production of highly pure, thin metallic copper layers.

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- 5 23. Process for the production of highly pure, thin metallic copper layers, characterised in that compounds of the general formula (I) according to Claims 1 to 9 are heated, causing elimination of the Lewis base L and deposition of metallic copper deposited through decarboxylation.
- 10 24. Process according to Claim 23, characterised in that the elimination of the Lewis base L is carried out at a temperature in the range from 50 to about 200°C, and the decarboxylation is completed at a temperature in the range from 150 to 350°C with formation of metallic copper.
- 15 25. Process according to Claims 23 and 24, characterised in that the Lewis base L eliminated is recycled, re-employed in a process according to Claims 10 to 21 and used for the production of highly pure, thin metallic copper layers.
- 20 26. Highly pure, thin metallic copper layer produced using a compound of the general formula (I) according to Claims 1 to 9.

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